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FIELD TRIP ACROSS THE BLUE RIDGE ANTICLINORIUM, SMITH RIVER ALLOCHTHON, AND SAURATOWN MOUNTAINS ANTICLINORIUM NEAR MARTINSVILLE, VIRGINIA

James F. Conley and William S. Henika

This road log and discussion of geology have been initially prepared for a 1½-day field trip of the Fifth Annual Virginia Geology Field Conference, November 3-4, 1973, sponsored by the Geology Section of the Virginia Academy of Science. It will serve as a guide, however, to anyone interested in seeing geologic features along or near the public roads in the area.

The route of the road log is in Franklin, Henry, and Patrick counties near Martinsville where the Division has mapped the geology in detail (Figure 1). The following reports, which cover the field-trip area and contain detailed geologic maps in color on modern 7.5-minute topographic quadrangle bases, are available from the Virginia Division of Mineral Resources, Box 3667, Charlottesville, Va. 22903. In addition to the prices, a four percent sales tax is required on all publications mailed to Virginia addresses.

Report of Investigations 16. GEOLOGY OF THE MARTINSVILLE WEST QUADRANGLE, VIRGINIA, by J. F. Conley and E. C. Toewe; 44 p., 1 map in color, 14 figs., 1 table, 1968. Price: $1.75.

Report of Investigations 22. GEOLOGY OF THE PHILPOTT RESERVOIR QUADRANGLE, VIRGINIA, by J. F. Conley and W. S. Henika; 46 p., 2 maps (1 in color), 18 figs., 1970. Price: $2.75.

Report of Investigations 26. GEOLOGY OF THE BASSETT QUADRANGLE, VIRGINIA, by W. S. Henika; 43 p., 1 map in color, 12 figs., 8 tables, 1971. Price: $2.75.

Report of Investigations 33. GEOLOGY OF THE SNOW CREEK, MARTINSVILLE EAST, PRICE, AND SPRAY QUADRANGLES, VIRGINIA, by J. F. Conley and W. S. Henika; 71 p., 5 maps (3 in color), 30 figs., 1 table, 1973. Price: $5.50.

The rocks to be examined are contained within three major regional structures that are from west to east the Blue Ridge anticlinorium, the Smith River allochthon, and the Sauratown Mountains anticlinorium (Figure 2).

BLUE RIDGE ANTICLINORIUM

The Blue Ridge anticlinorium in this area contains the Moneta gneiss that is unconformably(?) overlain by the Lynchburg Formation. The Moneta, which is the oldest rock at the surface in the anticlinorium in the road-log area, consists of amphibolite grade two mica gneiss containing amphibolite interlayers; in the western part of the Philpott Reservoir quadrangle it contains calcareous gneiss, marble, and calc-gneiss.

Rocks that are shown as Lynchburg Formation on the geologic map of Virginia (Virginia Division of Mineral Resources, 1963) and which are on strike with rocks at the type locality of the Lynchburg are at greenschist grade and contain recognizable sedimentary structures and beds of graphite schist. The contact between the Moneta and Lynchburg is placed where the monotonous sequence of gneisses and amphibolites of the Moneta give way to rocks containing recognizable metasedimentary structures and graphite-bearing rocks. The Lynchburg Formation consists of lithic conglomerates (especially near the base), conglomerates, and graywackes with interlayered metapelites, graphite schists, metavolcanic rocks, and quartzites. It has been

intruded by metagabbro sills. To the north the Moneta has been intruded by migmatites that have been dated at approximately one billion years old (Brown, 1970, p. 337), thus indicating a minimum age for the Moneta. Brown considers the Catoctin Formation, the base of which was dated by Rankin and others (1969) at 820 million years old, to be interbedded with the upper part of the Lynchburg, thus indicating a minimum age for the Lynchburg.

SMITH RIVER ALLOCHTHON

The Smith River allochthon is interpreted as a synformal allochthonous mass that tectonically overlies the James River synclinorium to the northeast. To the southwest it separates the Blue Ridge and Sauratown Mountains anticlinoria. The allochthon consists of a lower Bassett formation (granitic gneiss containing amphibolite) that is overlain by the Fork Mountain formation (high alumina schists containing interlayered quartzite). These rocks have been intruded by a large sill-like to slightly discordant, highly differentiated igneous mass—the Rich Acres formation and the Leatherwood Granite—predominantly of mafic composition. The probable pluton remnant has been dated at 1020 million years. It contains an early injection sequence of granite and gabbro. These are cut by a later sequence of norite and diorite.

The metasedimentary rocks of the allochthon show polyphase metamorphism and have been prograded regionally to amphibolite facies reaching staurolite grade along the northwestern border and sillimanite grade to the southeast of this border. Following this event these rocks were partially to wholly retrograded to greenschist facies. During intrusion by the Leatherwood Granite and Rich Acres formation, contact metamorphism produced partial melt zones and converted the schists to biotite gneisses and near the body developed kyanite, staurolite, and chloritoid progressively further away from the igneous body.

SAURATOWN MOUNTAINS ANTICLINORIUM

The core of the Sauratown Mountains anticlinorium is composed of biotite granitic augen gneiss, dated by Rankin (1971) as 1192 million years old at Pilot Mountain, North Carolina. This unit is overlain by pelitic schists, graphite schists, paragneisses, amphibolites, and marbles. These rocks are shown by Butler and Dunn (1968, Figure 8) to be equivalent to Lynchburg rocks in the Blue Ridge anticlinorium. This eastern band of metasedimentary rocks are at staurolite-kyanite grade; if they are equivalent to the greenschist grade rocks to the west, metamorphic grade must increase in a southeasterly direction.

First Day of Field Trip
Saturday, November 3, 1973

Point of origin: Entrance to Dutch Inn, on U. S. Highway 220, Collinsville, Virginia.

Cumulative Mileage	*Distance*	*Explanation*
0.0	0.0	Proceed northward on U. S. Highway 220.
2.0	2.0	Bassett Forks intersection; intersection of U. S. Highway 220 and State Highway 57; continue on U. S. Highway 220.
9.6	7.6	Cross Skelt Mountain.
13.6	4.0	Cross Big Chestnut Creek.
15.0	1.4	Turn right (eastward) on State Road 718.
15.6	0.6	*STOP 1.* Moneta gneiss exposed on the north side of State Road 718 at bridge over Big Chestnut Creek. Foliated mica gneiss with subordinate layers of light-gray plagioclase (oligoclase)-quartz gneiss mantled by a deep saprolite that is exposed in cut along the north side of the road. The saprolite is typical of that developed on the unit. The alternating mica-rich and plagioclase-quartz-rich bands can be distinguished in the saprolite.
15.9	0.3	Turn around and return to U. S. Highway 220.
16.7	0.8	Turn left (southward) on U. S. Highway 220.
18.1	1.4	Cross Big Chestnut Creek.
21.3	3.2	Turn right (westward) on State Road 605.
26.0	4.7	Turn right on State Road 606.
27.2	1.2	Intersection with State Road 767; keep to the right (northeastward) on State Road 606.
27.3	0.1	Turn right (eastward) on State Road 764.

Cumulative Mileage	*Distance*	*Explanation*
27.6	0.3	*STOP 2.* Moneta gneiss saprolite; exposure in roadcut on west side of road. Shows amphibolite layers in plagioclase-quartz-mica gneiss. The banding and well-developed foliation in the gneiss are apparent in this exposure.
27.7	0.1	Turn around and continue southwestward.
28.3	0.6	Turn left (southward) on State Road 606.
28.4	0.1	Intersection with State Road 767; keep left on State Road 606.
28.9	0.5	Cross bridge over tributary to Town Creek.
30.0	0.1	*STOP 3.* Basal part of the Lynchburg Formation. Consists of metaconglomerates and grits showing graded bedding. Continue southward on State Road 606.
30.5	0.5	Intersection with State Road 605 at Henry, Virginia; turn right (westward) on State Road 605 and cross bridge over Town Creek.
30.6	0.1	Cross Norfolk and Western Railway tracks.
30.8	0.2	Cross Franklin-Henry county boundary.
31.3	0.5	Cross Henry-Franklin county boundary.
32.8	1.5	Cross Mill Creek.
37.3	4.5	Turn left (southward) on State Road 623.
38.8	1.5	Cross Beards Creek.
40.8	2.0	Pass Ryans Branch Public Use Area on left.
41.0	0.2	Cross Ryans Branch.
41.2	0.2	Cross Union Bridge over Philpott Reservoir.
41.4	0.2	*STOP 4.* Lynchburg Formation; coarse-grained, flaggy graphitic schist and quartzite. Shows compositional foliation produced by alternating quartz-rich and mica-graphite layers.
41.6	0.2	Mine Branch Boat Ramp on left.
45.9	4.3	Cross Goblintown Creek at the head of Fairystone Lake.
46.2	0.3	Intersection of State Road 623 and State Highway 346; turn right (southwestward) on State Highway 346.
47.2	1.0	Intersection with State Highway 57; turn left (southeastward) on State Highway 57.
48.8	1.6	*STOP 5.* Lynchburg Formation; light-tan to gray, polydeformed quartzite interlayered in graphite schist. Continue southeastward on State Highway 57.
49.8	1.0	*STOP 6.* Bowens Creek fault; zone of chlorite phyllonite separating graphite schist of the Lynchburg Formation from staurolite schist of Fork Mountain formation. Continue on State Highway 57 and cross from the Blue Ridge anticlinorium into the Smith River allochthon.
50.2	0.4	Cross Patrick-Henry county boundary and into Henry County.
52.5	2.3	Turn left (northwestward) on State Road 601..
53.0	0.5	Enter Bowens Creek Public Use Area.
53.4	0.4	*STOP 7.* Staurolite-mica schist of the Fork Mountain formation; medium-gray. Schistose rock containing quartz-rich bands. Abundant staurolites altered to sericite "fairy stones" and rotated garnets partially altered to chlorite. Turn around and return to State Highway 57.
54.4	1.0	Turn left (northeastward) onto State Highway 57.
59.0	4.6	Intersection of State Highway 57 and State Highway 57A in front of Bassett High School; continue straight on State Highway 57A.
60.4	1.4	Cross Blackberry Creek.
61.9	1.5	Intersection of State Highway 57A and State Road 682; turn left (northeastward) on State Highway 57A.
62.1	0.2	Cross Smith River.
62.2	0.1	Cross Norfolk and Western Railway tracks.

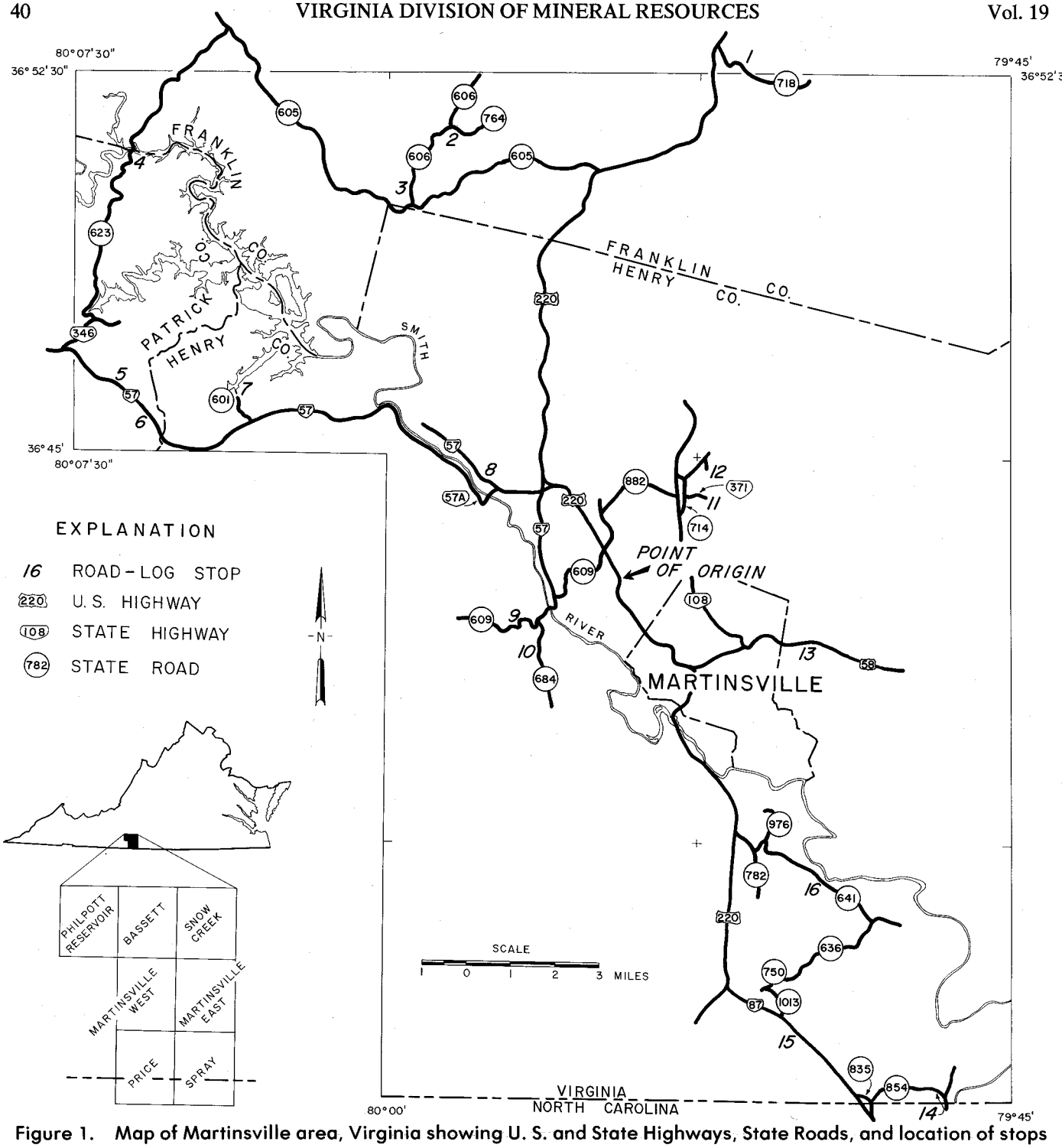

Figure 1. Map of Martinsville area, Virginia showing U. S. and State Highways, State Roads, and location of stops along road-log route.

Cumulative Mileage	*Distance*	*Explanation*
62.4	0.2	Intersection of State Highway 57A and State Highway 57; turn left (northwestward) on State Highway 57.
62.6	0.2	Turn right into Exxon service station, unload, and walk southeastward for 100 yards along sidewalk to stop 8. *STOP 8.* Bassett formation; segregation-banded biotite and hornblende-biotite granitic gneisses; mica produces a pervasive foliation. Turn around and continue eastward on State Highway 57.

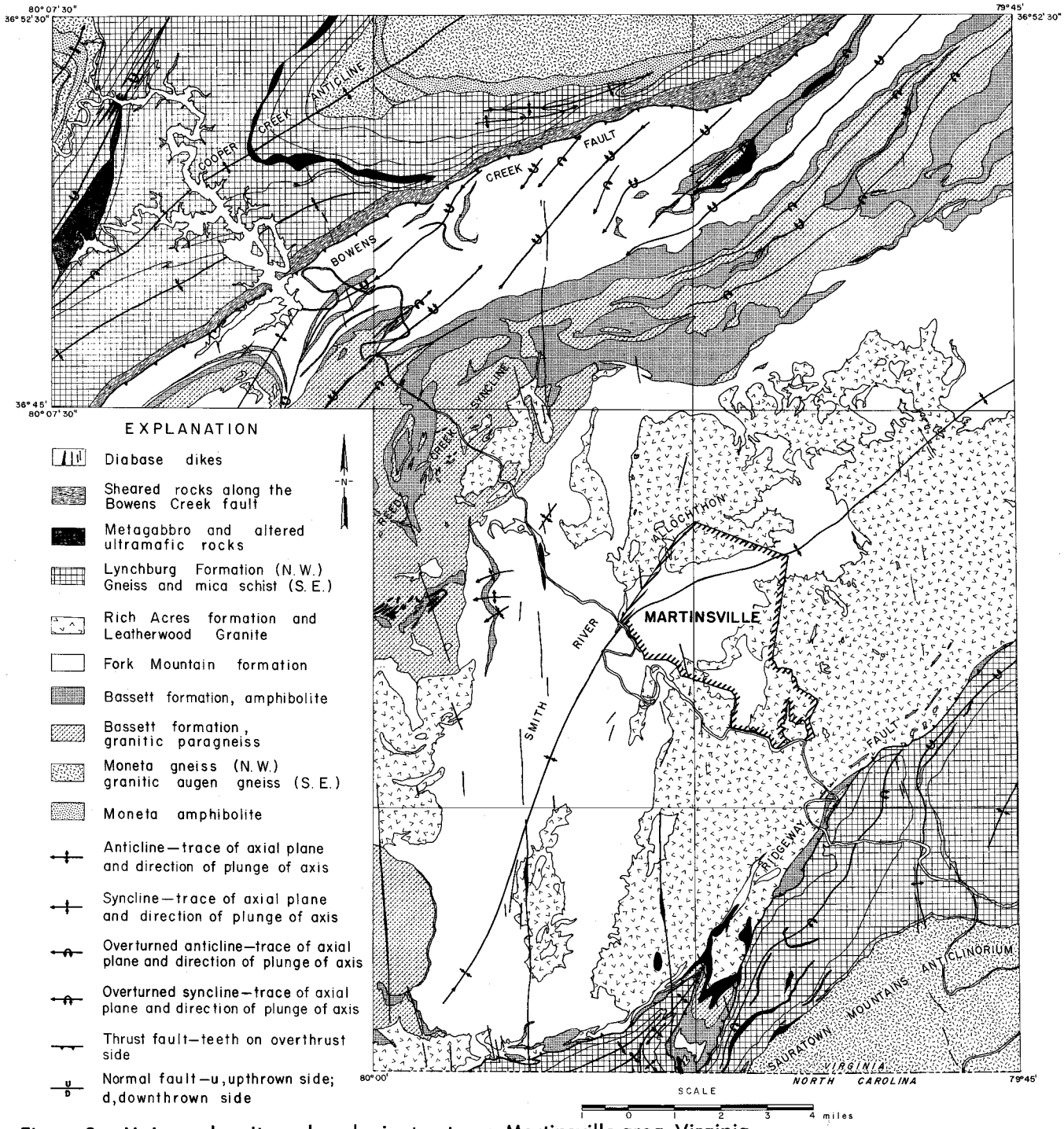

Figure 2. Major rock units and geologic structures, Martinsville area, Virginia.

Cumulative Mileage	*Distance*	*Explanation*
63.8	1.2	Intersection of State Highway 57 and State Highway 57A; bear right (southward) on State Highway 57.
64.4	0.6	Cross Reed Creek.
66.6	2.2	Turn right (westward) on State Road 701, cross Norfolk and Western Railway tracks, and cross Smith River.
66.7	0.1	Turn left (southwestward) on State Road 609 at the Fieldale intersection.
68.0	1.3	*STOP 9.* Friths store. Mica schist of the Fork Mountain formation con-

Cumulative Mileage	*Distance*	*Explanation*
		taining sillimanite that is partially altered to sericite. Turn around and continue eastward on State Road 609.
68.8	0.8	Turn right (southeastward) on State Road 684.
69.6	0.8	*STOP 10.* Garnetiferous biotite gneiss of the Fork Mountain formation exposed in the Martinsville Stone Company quarry. Biotite gneiss is segregated into biotite-rich and quartz-feldspar-rich bands. Turn around and continue northwestward on State Road 684.
70.3	0.7	Turn right (northeastward) on State Road 609.
70.7	0.4	Turn right (southeastward) on State Road 701.
70.8	0.1	Cross Smith River and the Norfolk and Western Railway tracks and turn left (northward) onto State Highway 57.
71.2	0.4	Turn right (eastward) on State Road 609.
73.2	2.0	Intersection with U. S. Highway 220; continue on State Road 609.
74.1	0.9	Turn right (northeastward) onto State Road 882.
76.4	2.3	Turn right (southeastward) onto State Highway 108.
76.8	0.4	Turn sharply left (north-northeastward) onto State Road 714.
77.3	0.5	Turn right (eastward) on State Highway 371 at entrance to Patrick Henry College.
78.3	1.0	*STOP 11.* Norite of the Rich Acres formation on the campus of Patrick Henry College. Spheroidally weathered boulders of subophitic to porphyritic augite-biotite-hypersthene-labradorite norite. *(Note: These rocks are part of the landscaping for the campus and hammers should be left in the vehicles!)* Turn around and continue westward on State Highway 371.
79.1	0.8	Turn right on State Road 714.
79.4	0.3	Cross Little Beaver Creek and turn right (northeastward) on access road to Martinsville Reservoir.
80.0	0.6	Turn right to pavilion and boat ramp.
80.2	0.2	*STOP 12.* Leatherwood Granite, porphyritic biotite-plagioclase-microcline granite. Phenocrysts are microcline and may show rapakivi texture; rock generally shows some granulation around grain boundaries. Turn around and proceed to Martinsville Reservoir access road.
80.4	0.2	Turn left onto Martinsville Reservoir access road.
80.9	0.5	Turn right onto State Road 714.
81.1	0.2	Turn left (southward) onto State Highway 108 and continue toward Martinsville.
81.9	0.8	Cross Beaver Creek.
82.9	1.0	Cross Little Beaver Creek.
83.3	0.4	Enter Martinsville city limits.
84.0	0.7	Turn left (northeastward) onto Clearview Drive.
84.1	0.1	Turn right (southeastward) onto Northside Drive.
85.0	0.9	Turn right (south-southeastward) onto State Highway 57 Bypass.
85.3	0.3	Turn left (northeastward) onto Fairy Street.
85.9	0.6	Turn left (north-northeastward) onto Church Street (U. S. Highway 58).
87.4	1.5	Turn right into Dominion Homes parking lot.
		STOP 13. Rich Acres formation; gabbro cut by veins of diorite.

End of first day of field trip, return to Dutch Inn Motel by way of U. S. Highway 58, State Highway 57, and U. S. Highway 220.

Second Day of Field Trip

Sunday, November 4, 1973

Point of origin: Entrance to Dutch Inn on U. S. Highway 220, Collinsville, Virginia.

Cumulative Mileage	*Distance*	*Explanation*
0.0	0.0	Turn onto U. S. Highway 220 south and proceed towards Martinsville.
3.3	3.3	Junction of U. S. Highway 220 and U. S. Highway 58; continue southward on U. S. Highway 58-220.
4.6	1.3	Cross Smith River.
4.8	0.2	Division of U. S. Highway 58 (to the west) from U. S. Highway 220; continue southward on U. S. Highway 220.
11.0	6.2	Intersection of U. S. Highway 220 and State Highway 87: turn left (southeastward) on State Highway 87.
14.7	3.7	Turn left (eastward) on State Road 835.
15.1	0.4	Intersection of State Roads 835 and 854; turn left (northeastward) on State Road 854. (Note: State Road 854 is shown on the U. S. Geological Survey 7.5-minute topographic quadrangle map of the Spray quadrangle as State Road 637 and on the Virginia Department of Highways Henry County highway map as State Road 884.
17.0	1.9	*STOP 14,* at intersection of State Roads 854 and 832 at Stuart Creek. Granitic augen gneiss in the core of the Sauratown Mountains anticlinorium. Coarse garnetiferous granitic augen gneiss, large fractured microcline and perthite augen. Quartz may fill fractures in the augen. Biotite is concentrated in segregation bands. Turn around and continue on State Road 854.
18.9	1.9	Intersection of State Roads 854 and 835; turn right (northward) on State Road 835.
19.4	0.5	Intersection of State Road 835 and State Highway 87; turn right (northwestward) onto State Highway 87.
20.7	1.3	Intersection of State Highway 87 and State Road 622 (note granitic flaser gneiss is exposed at the southwestern corner of this intersection).
21.3	0.6	*STOP 15.* Garnet-mica schist exposed in deep roadcut along State Highway 87, 0.1 mile south of parking area. Coarse-grained, silvery-gray, garnet-mica schist, may contain kyanite, staurolite, and interlayers of garnetiferous amphibole schist and graphite schist. Abundant garnets and large kyanite and staurolite crystals occur in the soil on the hill just west of this exposure.
21.8	0.5	Turn right (northward) on State Road 1013.
22.6	0.8	Turn right (northeastward) on State Road 750.
23.3	0.7	Turn right (northeastward) on State Road 636 at the Colonial Arms Restaurant.
24.6	1.3	Cross pipeline.
25.1	0.5	Y intersection of State Road 636 and State Road 634; bear left (northeastward) on State Road 636.
25.8	0.7	Turn left on State Road 641 (shown as State Road 642 on the U. S. Geological Survey Spray 7.5-minute topographic quadrangle map and on the Virginia Department of Highways Henry County road map.

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Cumulative Mileage	*Distance*	*Explanation*
27.2	1.4	*STOP 16.* Muscovite-biotite gneiss and alaskite along Marrowbone Creek. Cross bridge over Marrowbone Creek and park on north side of road just beyond the bridge; walk 0.1 mile back eastward to exposures in the roadcut. Medium-grained, light-gray, foliated muscovite-biotite-quartz plagioclase-microcline gneiss. The gneiss is cut by alaskite. Walk westward across the bridge and observe the sheared garnet-mica schist in the Ridgeway fault zone, exposed in cut on south side of the road.

End of second day of field trip.

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Virginia Division of Mineral Resources, 1963, Geologic map of Virginia: Virginia Division of Mineral Resources, scale 1:500,000.

TOPOGRAPHIC MAPS

Updated 7.5-minute quadrangle maps published from July 1-August 15, 1973

Barboursville	Ladysmith
Bluemont	Middletown
Bowling Green	Rochelle
Bridgewater	Rural Retreat
Elkton East	Sterling
Hayfield	Thoroughfare Gap
Keswick	Woodford